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【54】名　稱：具有水平自動控制功能之舟皿轉移用升降系統
ELEVATOR SYSTEM FOR BOAT TRANSFER WITH HORIZONTALITY AUTOMATIC CONTROL FUNCTION

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[57]申請專利範圍：

1.一種具有水平自動控制功能之半導體舟皿移轉用的升降機系統，該系統包含：

一舟皿，係被形成俾以支持相互平行之複數半導體晶圓，具有一個水平地保持在下部的底座及安裝於其上的晶圓；

一升降機，係連接至該舟皿俾以將該舟皿上下移動；

一感測單元，係當該舟皿位在一位置上而使該舟皿內之晶圓位在相對於水平面呈傾斜之平面上時，用以檢測出該狀態者；

一水平控制單元，其置於該舟皿底座與該升降機之間，係用以傾斜該舟皿底座俾以調整該舟皿底座與該升降機之間的距離；及

一控制單元，俾以接受來自該感測器裝置之可表示該舟皿之方位的水平狀態之資訊，並且根據該資訊將

控制信號輸出至該水平控制裝置。

2.如申請專利範圍第1項之升降機系統，其中該水平控制裝置包含：

一水平控制板，係固定至該升降機；

複數水平控制單元，係位於該舟皿底座與該水平控制板之間，其中該水平控制驅動部件係可彈性上下移動，

以改變該舟皿底座與該水平控制板之各個部分之間的距離，並藉此在該等各個部分上傾斜該舟皿底座；及

一驅動力產生部件，係操作性地連結至該水平控制驅動部件，俾用以驅動該水平驅動部件。

3.如申請專利範圍第2項之升降機系統，其中每一水平控制單元包含：

一組內螺紋，其係與該底座及該水平控制板中之一者形成一體；

一螺絲，係可垂直延伸地螺入該組內螺紋中；及

一傳動元件，係連結至該螺絲及該水平控制驅動部件，俾以傳送該水平控制驅動部件之輸出力至該螺絲，該輸出力可形成用以旋轉該螺絲之旋轉驅動力。

4.如申請專利範圍第3項之升降機系統，其中該傳動元件係包含至少一個齒輪。

5.如申請專利範圍第3項之升降機系統，其中該傳動元件包含至少一皮帶及一滑輪。

6.如申請專利範圍第3項之升降機系統，其中該傳動元件包含至少一鏈條及一鏈輪。

7.如申請專利範圍第3項之升降機系統，其中該傳動元件包含至少一金屬線及一滑輪。

8.如申請專利範圍第3項之升降機系

統，其中該驅動力產生部件包含一直流電馬達，其藉由接收一來自該控制單元的直流電功率，以產生該旋轉驅動力。

9.如申請專利範圍第3項之升降機系統，其中該驅動力產生部件包含一交流電馬達，其藉由接收一來自該控制單元的交流電功率，以產生該旋轉驅動力。

10.如申請專利範圍第3項之升降機系統，其中該驅動力產生部件包含一齒輪馬達，其藉由接收一來自該控制單元的功率，以產生該旋轉驅動力。

11.如申請專利範圍第3項之升降機系統，其中該驅動力產生部件包含一步進馬達，其藉由接收一來自該控制單元的功率，以產生該旋轉驅動力。

12.如申請專利範圍第8或9項之升降機系統，其中該控制單元接收來自於感測單元之舟皿水平狀態資訊，比較接收得知資料與已經輸入之資料，改變電壓或電流而校正二資料間之誤差，及藉施加該直流電功率及交流電功率至該直流或交流馬達，以控制該直流或交流馬達。

13.如申請專利範圍第11項之升降機系統，其中該控制單元接收來自感測單元之舟皿水平狀態資訊比較接收的資料與已經輸入之資料，將功率改變成一正脈波或負脈波以校正二資料間之誤差，及經由施加該正或負脈波至該步進馬達以控制該步進馬達。

14.如申請專利範圍第3項之升降機系統，其中該驅動力移轉部件為一用於移轉該旋轉驅動力之軸。

15.如申請專利範圍第2項之升降機系統，其中該水平控制驅動單元包

含；

一X軸水平控制驅動部件，其位於該底座下方並且沿著X軸至X軸及Y軸之原點的一側，其中該X軸水平控制驅動部件係控制該底座相對於該Y軸的傾斜度；及

一Y軸水平控制驅動部件，其位於底座下方並且沿著Y軸至該原點的一側，其中該Y軸水平控制驅動部件係控制該底座相對於該X軸的傾斜度。

16.如申請專利範圍第2項之升降機系統，其中該水平控制驅動部件包含一液壓缸，其藉由接收來自該驅動力產生部件之液壓，可在單向或雙向收縮或延伸。

17.如申請專利範圍第2項之升降機系統，其中該水平控制驅動部件包含一氣壓缸，其藉由接收來自該驅動力產生部件之氣壓，可在單向或雙向收縮或延伸。

18.如申請專利範圍第2項之升降機系統，其中該水平控制驅動部件包含一管路，其藉由接收來自該驅動力產生部件之液壓或氣壓，可在單向或雙向收縮或延伸。

19.如申請專利範圍第16-18項中任一項之升降機系統，其中該驅動力產生部件係為一液體泵，用於提供該氣壓或液壓至該水平控制驅動部件。

20.如申請專利範圍第16-18項之升降機系統，其中該驅動力產生部件係一液體轉換管路，用於依照該控制單元之控制，轉換該氣壓或液壓至該水平控制驅動部件。

21.如申請專利範圍第20項之升降機系

統，其中該控制單元選擇性地開啟或關閉該液體轉換管路，以選擇性地轉換由該驅動力產生部件產生的驅動力至該水平控制驅動部件。

22.如申請專利範圍第1項之升降機系統，其中該感測單元包含一置於該舟皿底座的水平計。

23.如申請專利範圍第1項之升降機系統，其中該感測單元包含兩對彼此相向之感光器及發光感測器，藉此使從一發光感測器發射至與其相關聯之感光器的光線，相對於從另一發光感測器發射至與其相關聯之感光器的光線，呈垂直傳送出。

24.如申請專利範圍第1項之升降機系統，其中該感測單元包含複數個壓力感測器，其設置於該底座下方俾用以檢測該底座上晶圓之載重。

25.如申請專利範圍第1項之升降機系統，其中該感測單元包含一垂直地固定於該底座的水平感測器，俾用以檢測該底座之水平誤差。

圖式簡單說明：

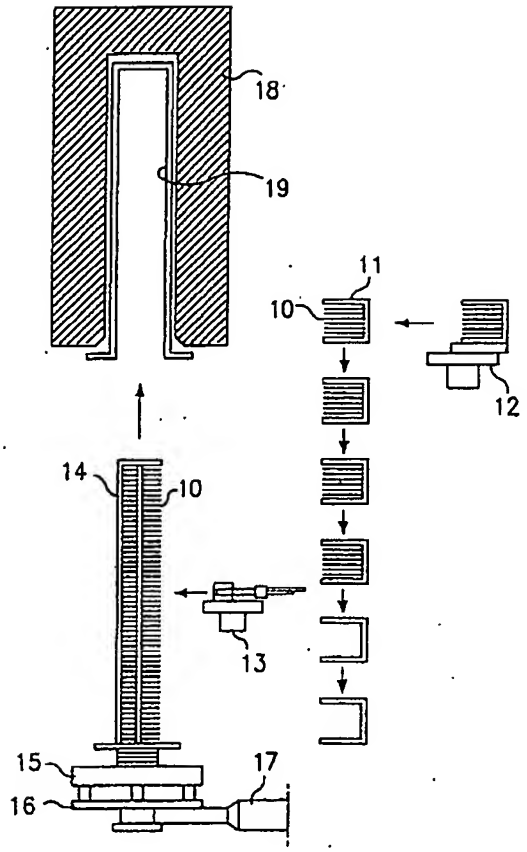
第1圖為示意代表圖示例說明習知半導體舟皿移轉用升降機系統之工作；

第2圖為底視圖示例說明第1圖之半導體舟皿移轉用升降機系統；

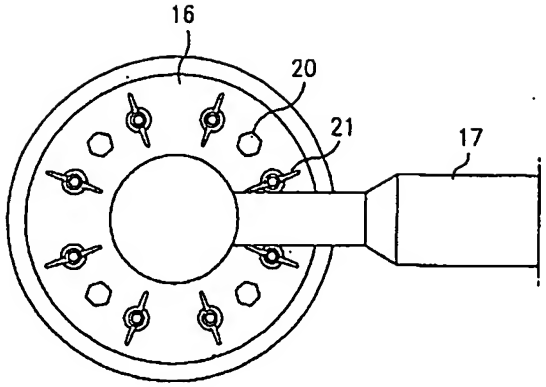
第3圖為示意代表圖示例說明根據本創作之具體例之半導體舟皿移轉用升降機系統之作業；

第4圖為示意圖示例說明第3圖之具有自動水平控制功能之半導體舟皿移轉用升降機系統；及

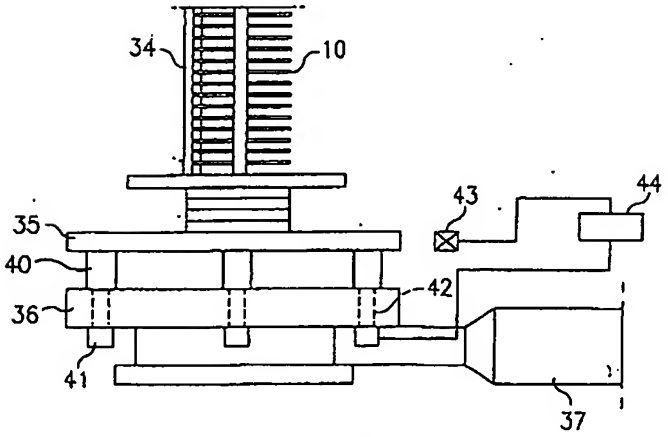
第5圖為底視圖示例說明第4圖之水平控制單元。



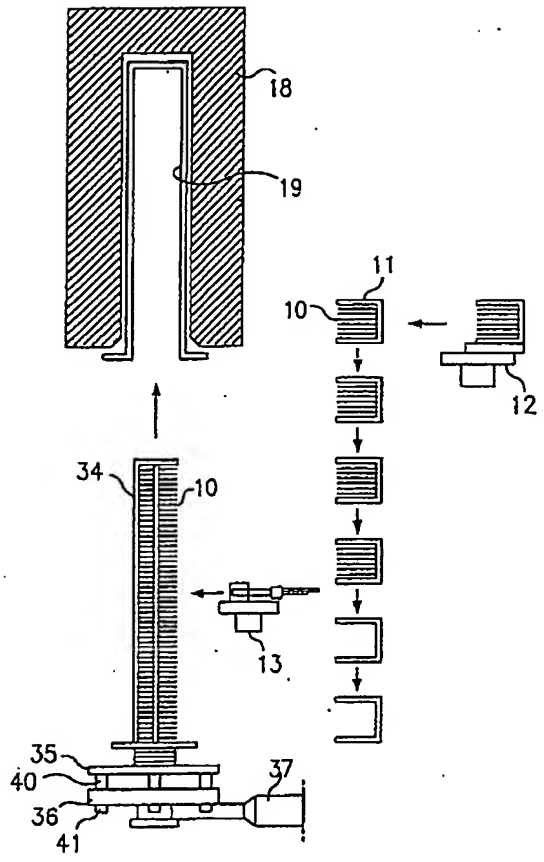
第 1 圖



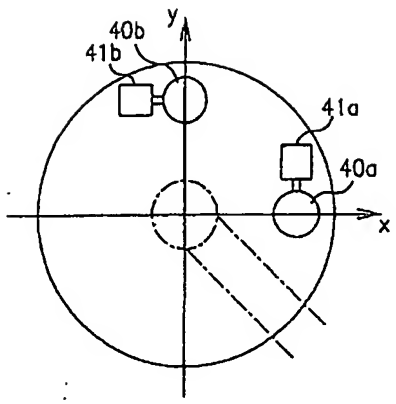
第 2 圖



第 4 圖



第 3 圖



第 5 圖

SN 10/593,601

93206408

R. O. C. Patent Application No. 87110468
Date of Amendment: 2003/11/04
Amended Claims

1. An elevator system for a semiconductor boat transfer with horizontality automatic control function, the system for a system comprising:

a boat configured to support a plurality of semiconductor wafer parallel to one another, the boat having a base maintained horizontally in the lower part and wafer mounted thereon;

an elevator connected to the boat so as to move the boat up and down;

a sensing unit for detecting when the boat is in a position in which the wafer in the boat lie lanes inclined relative to the horizontality;

a horizontal control unit placed between the base of the boat and the elevator to tilt the base of the boat so as to adjust a distance between the base of the boat and the elevator; and

a control unit for receiving an information of a horizontal state of the boat including an orientation of the boat from the sensing unit, and for outputting a control signal to the horizontal control unit.

2. The system of claim 1, wherein the horizontal control unit comprises:

a horizontal control plate fixed on the elevator;

a plurality of horizontal control driving parts interposed between the base of the boat and the horizontal control plate; wherein the horizontal control driving parts are movable flexibly up and down to change the distance respective portions of the base of the boat and the horizontal control plate to thereby tilt the base of the boat at the respective portions thereof; and

a driving force generating part operative connected to the horizontal control driving parts for applying driving force to the horizontal control driving parts so as to drive the horizontal driving parts.

3. The system of claim 2, wherein each of the horizontal control unit comprises:

a set of female threads integral with one of the base of the boat and the horizontal control plate;

a screw threaded to the set of the female thread and extending vertically; and

a transmission connected to the screw and to the horizontal control driving parts so as to transfer an output of the horizontal control driving parts to the screw in a form of a rotative driving force that rotates the screw.

4. The system of claim 3, wherein the transmission comprises at least one gear.

5. The system of claim 3, wherein the transmission comprises at least one belt and one pulley.

6. The system of claim 3, wherein the transmission comprises at least one chain and one sprocket wheel.

7. The system of claim 3, wherein the transmission comprises at least one wire and one pulley.

8. The system of claim 3, wherein the driving force generating part comprises a DC motor that generates the rotative driving force by receiving a DC power from the control unit.

9. The system of claim 3, wherein the driving force generating part comprises an AC motor that generates the rotative driving force by receiving an AG power from the control unit.

10. The system of claim 3, wherein the driving force generating part comprises a geared motor that generates the rotative driving force by receiving a power from the control unit.

11. The system of claim 3, wherein the driving force generating part comprises a step motor that generates the rotative driving force by receiving a power from the control unit.

12. The system of anyone of claims 8 or 9 wherein the control unit receives the information including the horizontal state of the boat from the sensing unit, compares the received information with an information already inputted, changes a voltage or a current so as to correct an error between the two informations, and controls the DC motor or the AC motor.

13. The system of claim 11, wherein the control unit receives the information including the horizontal state of the boat from the sensing unit, compares the received information with an information already inputted, changes the power into a positive pulse wave or a negative pulse wave as to correct an error between the two informations, and controls the step motor by applying the positive or negative pulse wave to the step motor.

14. The system of claim 3, wherein the driving force transferring part is a shaft for transferring the rotative driving part.

15. The system of claim 2, wherein the horizontal control driving part comprises:

a X-axis horizontal control driving part placed beneath the base and to one side of the origin of X and Y axes along the X-axis wherein the X-axis horizontal control driving part controls the inclination of the base about the Y-axis; and

a Y-axis horizontal control driving part placed beneath the base and to one side of the origin along the Y-axis wherein the Y-axis horizontal control driving part controls the inclination of the base about the X-axis.

16. The system of claim 2, wherein the horizontal control driving part comprises a hydraulic pressure cylinder that is shrinkable or expandable in one direction or both directions by receiving a hydraulic pressure from the driving force generating part.

17. The system of claim 2, wherein the horizontal control driving part comprises a pneumatic pressure cylinder that is shankable or expandable in one direction or both directions by receiving a pneumatic pressure from the driving force generating part.

18. The system of claim 2, wherein the horizontal control driving part comprises a tube that is shrinkable or expandable in one direction or both directions by receiving a hydraulic pressure or a pneumatic pressure from the driving force generating part.

19. The system of any one of claims 16 to 18, wherein the driving force generating part is a fluid pump for providing the pneumatic pressure or the hydraulic pressure to the horizontal control driving part.

20. The system of any one of claims 16 to 18, wherein the driving force generating part is a fluid transfer pipe for transferring the pneumatic pressure or the hydraulic pressure to the horizontal control driving part in accordance with a control of the control unit.

21. The system of claim 20, wherein the control unit selectively opens or closes the fluid transfer pipe so as to selectively transfer the driving farce generated from the driving force generating part to the horizontal control driving part.

22. The system of claim 1, wherein the sensing unit comprises a level gauge disposed on the base of the boat.

23. The system of claim 1, wherein the sensing unit comprises two pairs of photo sensors and light emitting sensors positioned relative to one another such that light emitted from one of the light emitting sensors towards the photo sensor associated therewith propagates perpendicularly to the light emitted from the other light emitting sensor toward the photo sensor associated therewith.

24. The system of claim 1 wherein the sensing unit comprises a plurality of pressure sensors disposed under the base for detecting load of the wafer on the base.

25. The system of claim 1, wherein the sensing unit comprises a horizontality sensor vertically fixed on the base for detecting an horizontality error of the boat.

ELEVATOR SYSTEM FOR BOAT TRANSFER WITH HORIZONTALITY AUTOMATIC CONTROL FUNCTION

Field of the Invention

The present invention relates to an elevator system for boat transfer in semiconductor device fabrication processes, and more particularly, to an elevator system for boat transfer with a function to automatically control the horizontal state of wafers inside a boat.

Description of the Related Art

Generally, a plurality of processes are involved in the semiconductor device fabrication, and accordingly, various kinds of equipments and auxiliary equipments are necessary.

Among the above processes, a diffusion process is directed to provide semiconductor devices with an electrical characteristics including steps of the formation of an oxide film, and the annealing treatment, wherein the surface of the wafer is exposed to the solid or the gas containing boron or phosphorus, etc. under a high temperature condition.

A furnace is a piece of the equipments used in the

diffusion process, and it is composed of a quartz tube and a heating chamber for heating the quartz tube.

As auxiliary equipment in addition to the furnace, there are a gas supply unit for supplying refined processing gas into a chamber for a predetermined time, an elevator for transferring wafers loaded in the boat into a furnace while moving up/down, a wafer transfer for loading/unloading wafers into the boat, a cassette transfer for transferring the cassette with wafers therein into the wafer transfer by cassette, and a facility control unit for mechanically controlling the above elements.

The conventional diffusion process system, as shown in Fig. 1, comprises a quartz tube 19 designed to protect the processing from the surrounding processing environment, a heating chamber 18 for heating the quartz tube 19, an elevator 17 for loading/unloading wafers 10 in a boat into the furnace while moving up/down, a wafer transfer 13 for loading/unloading the wafers 10 into the boat 14, a cassette transfer 12 for transferring the cassette 11 with wafers 10 therein into the wafer transfer 13 by cassette, and a facility control unit (not shown in drawings) for mechanically controlling the above elements, and a gas supply unit for injecting various kinds of refined gases necessary for each process into each heating chamber.

In addition, the conventional elevator system for

the boat transfer comprises a boat 14 moving up/down vertically-erected for transferring the wafers 10 mounted therein into a heating chamber 18, a base 15 fixed under the boat 14 and vertically supporting the boat 14, an elevator 17 moving up/down, and a horizontal-control plate 16 screw-coupled between the upper plate of the elevator 17 and the base 15, and manually controlling the horizontality of the base 15.

As shown in Fig. 2 illustrating the bottom of the horizontal-control plate 16, there are four of hexagon head bolts 20 which are placed at the point of each direction of a X-Y axis, and the horizontality of the wafer 10 is controlled by rotating the hexagon head bolts 20 clockwise or anticlockwise and thereby adjusting the inclined angle between the base 15 and the horizontal control plate 16, and wing nuts 21 placed on both sides of each hexagon head bolt 20 serve to fasten the corresponding bolt 20 in order to prevent the hexagon head bolt 20 from being loose.

However, in the event that the boat 14, which should be erected vertically with right angle against the base 15, is inclined by various reasons, such as overloading or pressure from outer environments, the wafers mounted in the boat 14 cannot be placed in the horizontal aligning state any more thereby resulting in the deviation of the wafers, ill-production of the wafers, and the facility damage and the like so that the operator

periodically makes loose the wing nuts 21 placed on the bottom of the horizontal-control plate 16 so as to rotate the each of the hexagon head bolts 20, and adjusts the horizontality of the base 15 directly and manually with naked eyes and re-fastens the eight wing nuts 21.

However, the conventional method is inefficient because the operator should control the hexagon head bolts repeatedly and directly for himself depending on his visual sight, and the coupling work of the four hexagon head bolts and the eight wing nuts is very time-consuming.

Summary of the Invention

The present invention is directed to provide an elevator system for boat transfer with horizontality automatic control function in semiconductor device fabrication process, which substantially obviates one or more of the problems due to the disadvantages and the limitations of the related art.

One object of the present invention is to provide an elevator system for boat transfer with horizontality automatic control function, wherein the elevator can automatically adjust the horizontal state of a boat in order to transfer semiconductor wafers loaded in the boat in a horizontal state.

Another object of the present invention is to provide an elevator system for boat transfer with horizontality automatic control function for preventing the wafers from deviating thereby to save the time for wafer aligning and improve the wafer quality.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the elevator system for boat transfer with automatic horizontal control function comprises a boat with wafers mounted thereon having a base maintained horizontal in the lower part, an elevator for loading/unloading the boat into a processing chamber; a sensing unit for detecting the horizontal state of the boat, a horizontal control unit which is placed between the base of the boat and the elevator, and maintain the horizontal state of the boat by controlling the distance between two of them, and a control unit for receiving the information for the horizontal state of the boat from the sensing unit, and outputting a control signal to the horizontal control unit.

The horizontal control unit comprises a horizontal control plate fixed on the upper side of the elevator, a plurality of horizontal control driving parts which are placed between the base and the horizontal control plate, and flexibly-movable up/down between two of them in order to be aligned horizontally so that the inclination of the

base is adjusted, and a driving force generating part for supplying the driving force to the horizontal control driving part.

The sensing unit comprises a level gauge or two pairs of photo sensors and light emitting sensors. The sensors and emitting sensors are placed such that the incident lights from the emitting sensors are perpendicularly crossed each other in the horizontal bases, and are installed close to the boat to be horizontally-aligned.

Meanwhile, the elevator system with horizontality automatic control function in semiconductor device fabrication process of the present invention, the system further comprises a display unit connected to the control unit and displaying the horizontal information of the boat which is received from the sensing unit, and an input unit which is connected to the control unit, receives the horizontal align operational work order, turns it into order code, and sends it to the control unit.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Brief Description of the Drawings

In the accompanying drawings :

Fig. 1 is a schematic representation illustrating the operation of the conventional elevator system for semiconductor boat transfer ;

Fig. 2 is a bottom view illustrating the elevator system for semiconductor boat transfer of the Fig. 1 ;

Fig. 3 is a schematic representation illustrating the operation of the elevator system for semiconductor boat transfer according to one embodiment of the present invention ;

Fig. 4 is a schematic view illustrating the elevator system with automatic horizontal control function for semiconductor boat transfer of the Fig. 3 ; and

Fig. 5 is a bottom view illustrating the horizontal control unit of the Fig. 4.

Detailed Description of the Preferred Embodiments

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Fig. 3 is a schematic representation illustrating the operation of the elevator system for semiconductor boat transfer according to one embodiment of the present

invention, and Fig. 4 is a schematic view illustrating the elevator system with automatic horizontality control function for semiconductor boat transfer of the Fig. 3.

Referring to Fig. 3 and Fig. 4, the elevator system for semiconductor boat transfer comprises ; a boat 34 which is vertically-shaped and made of quartz, and transfers a plurality of wafers into a processing chamber with the plurality of wafers horizontally mounted thereon, and has a base 35 which is disk-shaped and horizontally supports the boat 34, an elevator 37 for moving up/down, a horizontal control plate 36 horizontally fixed on the elevator 37, a plurality of horizontal control driving part 40 which support the boat 34 and the base 35, and is movable flexibly up/down between the bottom of the base 35 and the top of the horizontal control plate 36 so as to adjust each distance between the two of them in order to control the horizontal state of the base 35, a driving force generating part 41 for generating the driving force for the horizontal control driving part 40 and transferring the driving force to the plurality of horizontal control driving part 40 by means of driving force transferring part, a control unit 44 for receiving the information of the horizontal state of the wafers and controlling the operation of the horizontal control driving part 40, and a sensing unit 43 for detecting the horizontal state of the base 35 and the wafers thereon and outputting the

information to the control unit 44.

The plurality of horizontal control driving part 40 can be constructed with a X-axis horizontal control driving part 40a which is placed on one side of the X-axis under the base 35, and controls the inclination of the base 35 up and down and a Y-axis horizontal control driving part 40b which is placed on one side of the Y-axis under the base 35, and controls the inclination of the base 35 up and down.

Various kinds of the horizontal control driving part 40 can be made such as hydraulic pressure cylinder or pneumatic pressure cylinder, or tube which can be shrinkable or expandable in one direction or both directions on receipt of hydraulic pressure or pneumatic pressure from the driving force generating part.

In case of using pneumatic pressure or hydraulic pressure as the horizontal control driving part, the driving force generating part employs a fluid pump to provide pneumatic pressure or hydraulic pressure, and a fluid transfer pipe is used for transferring the hydraulic pressure or the pneumatic pressure to the horizontal control driving part in accordance with the control of the control unit 44. In addition, the fluid transfer pipe is selectively opened/closed in accordance with the opening/closing of the inside path in order to control the operation of the horizontal control driving part, and the pneumatic pressure or the hydraulic

pressure from the driving force generating part is controlled by the control unit 44 selectively transferring the driving force to the cylinder of the horizontal control driving part.

Meanwhile, the horizontal control driving part 40 is preferably constructed as screw-way elevating device comprising a female screw part connected to the base 35, having a vertically-shaped female screw hole therein, a male screw part screw-coupled with the horizontal control plate 36 through the female screw part, and moving up/down rotating clockwise or anticlockwise; and a transmission for changing the rotative force received from the driving force generating part through the driving force transferring part into the rotative force having a proper rotation number and a proper rotative force and transferring it to the male screw part.

In case of using the screw-way elevating device as the horizontal control driving part, the transmission can be composed of the combination of at least one transmission gear, the combination of a belt and a pulley, the combination of chain and sprocket wheel, or the combination of wire and pulley, and preferably comprises the combination of a plurality of transmission gears.

In addition, the driving force generating part for generating the rotative driving force preferably uses a motor 41, and as the motor 41, there may be introduced a

DC motor (Direct Current motor) for generating rotative driving force after receiving DC power source from the control unit 44 , an AC motor (Alternating Current motor) for generating rotative driving force after receiving AC power source from the control unit 44, a geared motor which generates rotative driving force after receiving the power, and generates a proper rotation number and a proper rotation force with gear combination equipped therein, or a step motor for allowing a precise control for the operation after receiving the pulse power source, but the step motor is preferably used as the motor 44 for precise control.

The motor 41, as shown in Fig. 5, is constructed by connecting a X-axis motor 41a and a Y-axis motor 41b to the X-axis horizontal control driving part 40a and the Y-axis horizontal control driving part 40b respectively.

In addition, the control unit 44 for controlling the DC and the AC motor receives the information for the horizontal state of the boat from a sensor 43, and compares the received data with the data which is already input. Then, the control unit 44 changes the voltage or the current so as to correct the error between the said data, and controls by applying the above power to the DC or the AC motor. In case of controlling the step motor, the control unit 44 receives the information for the horizontality of the boat from the sensor 43, compares the received information with the data already input,

changes the power into positive or negative pulse wave so as to correct the error between the two data, and controls by applying the pulse wave into the step motor.

A shaft 42 which is rotated with connected to the motor 41 serves as the driving force transferring part for transferring the rotative driving force to the male screw part of the horizontal control driving part 40. In addition, two pairs of photo sensors and the light emitting sensors are horizontally installed near to the base 35 or wafer 10 such that the light from the sensors and the emitting sensors are crossed perpendicularly each other in order to detect the inclined angle of the base 35 or the wafer 10, that is, the error of the horizontal state of the base 35 or the wafer 10 is detected by the above photo sensor. Or, a plurality of pressure sensors are placed under the base 35 and detects each loading pressure of the loaded wafers 10. Or, a horizontality sensor can be provided to detect the horizontality error of the base 35 or the wafer 10, which is installed vertically-fixed on the base 35, and detects the gravity direction by providing contact sensors or pressure sensors around the gravity pendulum equipped thereinside. Or, a level gauge can be provided on the base 35.

In addition, a display unit is provided with connected with the control unit 44 in order to display the received information for the horizontal state of the base 35 or the wafer 10 from the sensor 43, and an input

unit is provided with connected with the control unit 44 in order to receive the horizontal alignment operation order, convert it into order code, and transfer it into the control unit 44.

Therefore, an operator can check the horizontal alignment state of the base 35 or the wafer 10 through the display unit. In case of non-horizontal alignment state, the order from the operator is input into the control unit 44 through the input unit. The control unit 44 analyzes horizontality information data of XY-axis based on the data received from the sensor 43, and the motor which is connected to the horizontal control driving part through the shaft, is controlled so as to horizontally align the base or the wafer.

In addition, the horizontal alignment work is periodically repeated according to the program inside the control unit 44, and in case, is performed by steps according to the order of the operator.

The elevator system for boat transfer with horizontality automatic control function according to the present invention, the elevator system makes the wafers on the boat to be horizontally aligned by detecting the inclination of the boat and automatically controlling the horizontality of the wafers so that the operation time and efforts are saved and the deviation of the wafers are prevented thereby producing a high quality of wafers.

Still further, while the present invention has been

described in detail, it should be understood that various changes, substitutions and alterations can be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is :

1. An elevator system for a semiconductor boat transfer with horizontality automatic control function, the system comprising :

a boat having a base maintained horizontally in the lower part and wafers mounted thereon ;

an elevator for loading/unloading the boat into a processing chamber ;

a sensing unit for detecting the horizontal state of the boat ;

a horizontal control unit which is placed between the base of the boat and the elevator, and maintain the horizontal state of the boat by controlling the distance between two of them ; and

a control unit for receiving the information for the horizontal state of the boat from the sensing unit, and outputting a control signal to the horizontal control unit.

2. The elevator system of claim 1, wherein the horizontal control unit comprises :

a horizontal control plate fixed on the elevator ;

a plurality of horizontal control driving parts which are placed between the base and the horizontal control plate, and movable flexibly up/down between two of them so as to be horizontally aligned with the

horizontal control plate so that the inclination of the base is adjusted ; and

a driving force generating part for supplying the driving force to the horizontal control driving part.

3. The elevator system of claim 2, wherein the horizontal control driving part comprises :

a female screw part having a vertically-shaped female screw hole therein, and connected to the base ;

a male screw part screw-coupled with the horizontal control plate through the female screw part, and moving up/down rotating clockwise or anticlockwise ; and

a transmission for changing the rotative driving force received from the driving force generating part through the driving force transferring part into the rotative driving force having a proper rotation number and a proper rotation force and transferring it to the male screw part.

4. The elevator system of claim 3, wherein the transmission is composed of the combination of at least one transmission gear.

5. The elevator system of claim 3, wherein the transmission comprises the combination of at least one belt and one pulley.

6. The elevator system of claim 3, wherein the transmission comprises the combination of at least one chain and one sprocket wheel.

7. The elevator system of claim 3, wherein the transmission comprises the combination of at least one wire and one pulley.

8. The elevator system of claim 3, wherein the driving force generating part comprises a DC motor (Direct Current motor) for generating rotative driving force by receiving DC power source from the control unit.

9. The elevator system of claim 3, wherein the driving force generating part comprises an AC motor (Alternating Current motor) for generating rotative driving force by receiving AC power source from the control unit.

10. The elevator system of claim 3, wherein the driving force generating part comprises a geared motor which generates rotative driving force by receiving the power from the control unit, and generates a proper rotation number and a proper rotation force with gear combination equipped therein.

11. The elevator system of claim 3, wherein the

driving force generating part is a step motor for allowing a precise control for the operation by receiving the pulse power source.

12. The elevator system in any of claim 8 to 10, wherein the control unit receives the information for the horizontal state of the boat from the sensing unit, compares the received data with the data which is already inputted, changes the voltage or the current so as to correct the error between the two data, and controls by applying the above power to the DC or the AC motor.

13. The elevator system of claim 11, wherein the control unit receives the information for the horizontal state of the boat from the sensing unit, compares the received information with the data already inputted, changes the power into positive or negative pulse wave so as to correct the error between the two data, and controls by applying the pulse wave into the step motor.

14. The elevator system of claim 3, wherein the driving force transferring part is a shaft for transferring rotative driving force.

15. The elevator system of claim 2 or claim 3, wherein the horizontal control driving part comprises ;

a X-axis horizontal control driving part which is

placed on one side of the X-axis under the base and controls the inclination of the base up and down and

a Y-axis horizontal control driving part which is placed on one side of the Y-axis under the base and controls the inclination of the base up and down.

16. The elevator system of claim 2, wherein the horizontal control driving part comprises a hydraulic pressure cylinder which can be shrinkable or expandable in one direction or both directions on receipt of hydraulic pressure from the driving force generating part.

17. The elevator system of claim 2, wherein the horizontal control driving part comprises a pneumatic pressure cylinder which can be shrinkable or expandable in one direction or both directions on receipt of pneumatic pressure from the driving force generating part.

18. The elevator system of claim 2, wherein the horizontal control driving part comprises a tube which can be shrinkable or expandable in one direction or both directions on receipt of hydraulic pressure or pneumatic pressure from the driving force generating part.

19. The elevator system in any of claim 16 to 18,

wherein the driving force generating part is a fluid pump to provide pneumatic pressure or hydraulic pressure.

20. The elevator system in any of claim 16 to 18, wherein the driving force transferring part is a fluid transfer pipe for transferring the hydraulic pressure or the pneumatic pressure to the horizontal control driving part in accordance with the control of the control unit

21. The elevator system of claim 20, wherein the control unit selectively opens/closes the fluid transfer pipe connected to inside path in accordance with the opening/closing of the inside path of the fluid transfer pipe in order to selectively transfer the driving force of the driving force generating part to the cylinder of the horizontal control driving part.

22. The elevator system of claim 1, wherein the sensing unit comprises a level gauge installed on the base.

23. The elevator system of claim 1, the sensing unit comprising two pairs of photo sensors and light emitting sensors, wherein the photo sensors and the light emitting sensors are placed such that the incident lights from the emitting sensors are perpendicularly crossed each other in the horizontal bases, and are installed close to the

boat to be horizontally-aligned in order to detect horizontality errors.

24. The elevator system of claim 1, wherein the sensing unit comprises a plurality of pressure sensors which are placed under the base and detect each loading pressure of the loaded wafers.

25. The elevator system of claim 1, wherein the sensing unit comprises a horizontality sensor to detect the horizontality error of the boat, which is installed vertically-fixed on the base and detects the gravity direction by providing contact sensors or pressure sensors around the gravity pendulum equipped thereinside.

26. The elevator system of claim 1, further comprising a display unit connected to the control unit and displaying the horizontal information of the boat which is received from the sensing unit.

27. The elevator system of claim 1, further comprising an input unit which is connected to the control unit, receives the horizontal alignment operation order, turns it into order code, and sends it to the control unit.

28. The elevator system of claim 1, wherein the

control unit periodically repeatedly receives the information for the horizontal state of the boat from the sensing unit by the program inside the control unit, and applies the control signal to the horizontal control unit.

Abstract of the Disclosure

There is provided an elevator system for boat transfer with horizontality automatic control function for automatically adjusting the horizontal state of the boat in the semiconductor devices fabrication processes, wherein the time for horizontal alignment operation is saved, and the deviation of the wafers is prevented. The elevator system comprises : a boat having a base maintained horizontally in the lower part and wafers mounted thereon ; an elevator for loading/unloading the boat into a processing chamber ; a sensing unit for detecting the horizontal state of the boat ; a horizontal control unit which is placed between the base of the boat and the elevator, and maintain the horizontal state of the boat by controlling the distance between two of them ; and a control unit for receiving the information for the horizontal state of the boat from the sensing unit, and outputting a control signal to the horizontal control unit.

FIG. 1
(PRIOR ART)

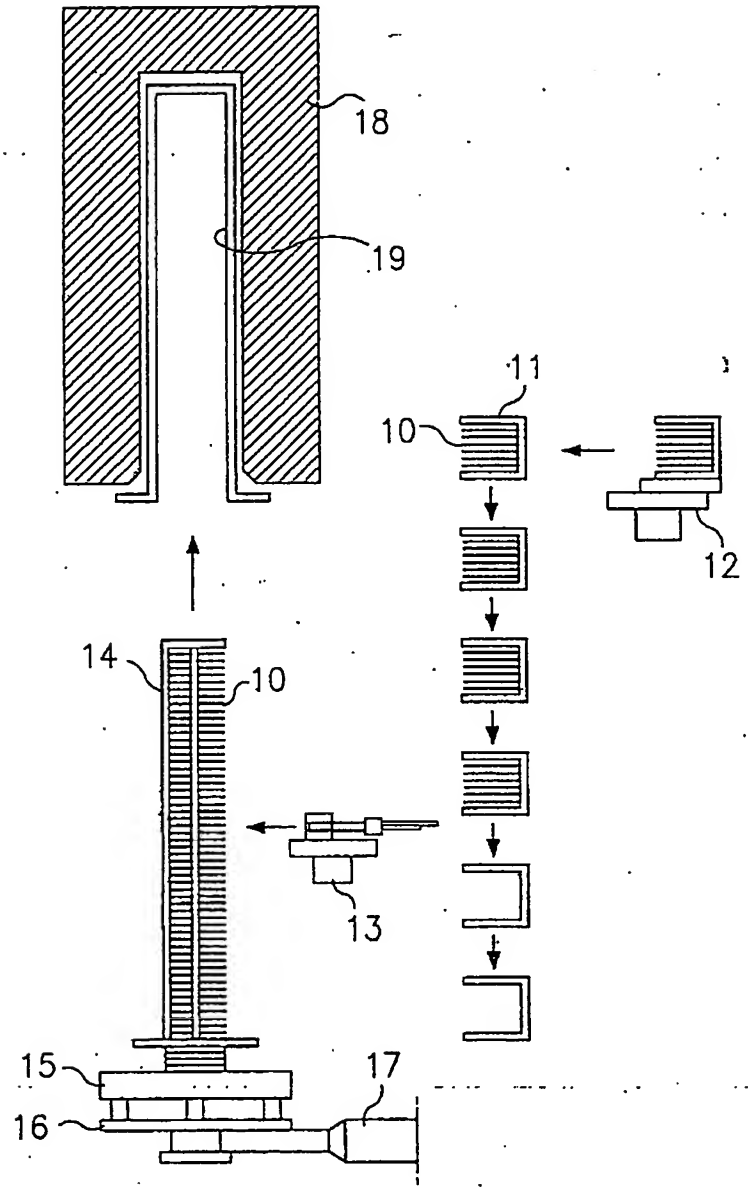


FIG. 2
(PRIOR ART)

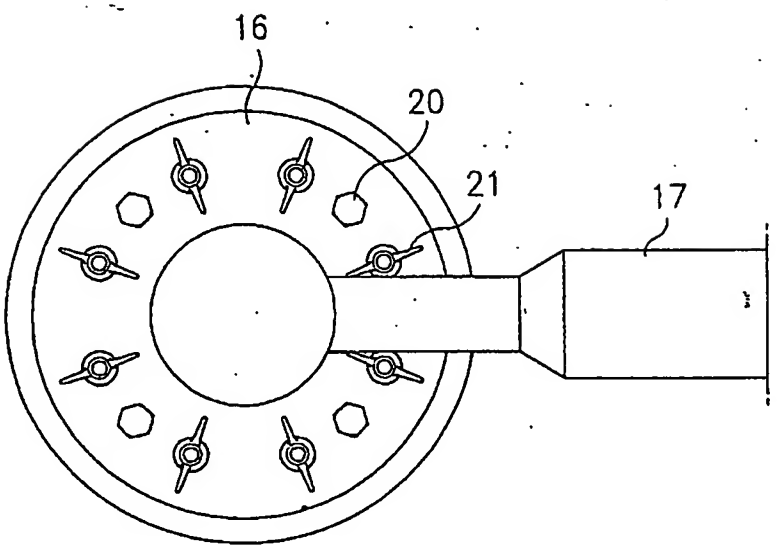


FIG. 3

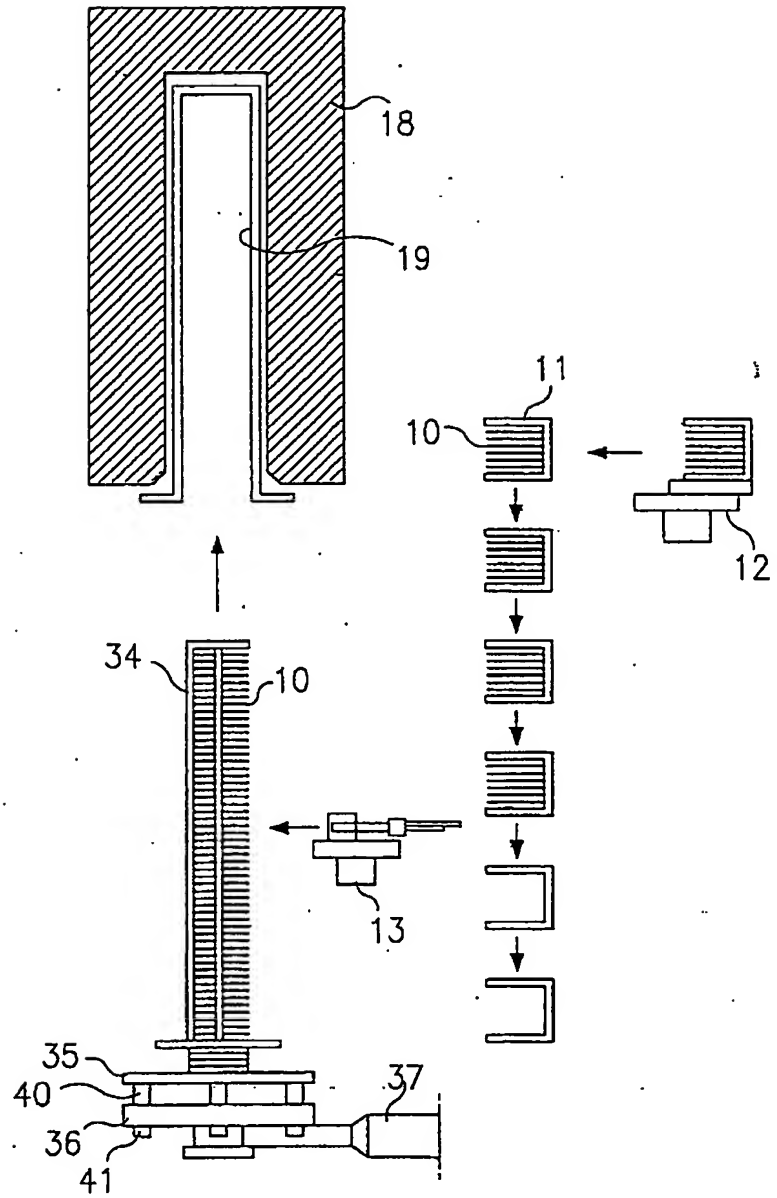


FIG. 4

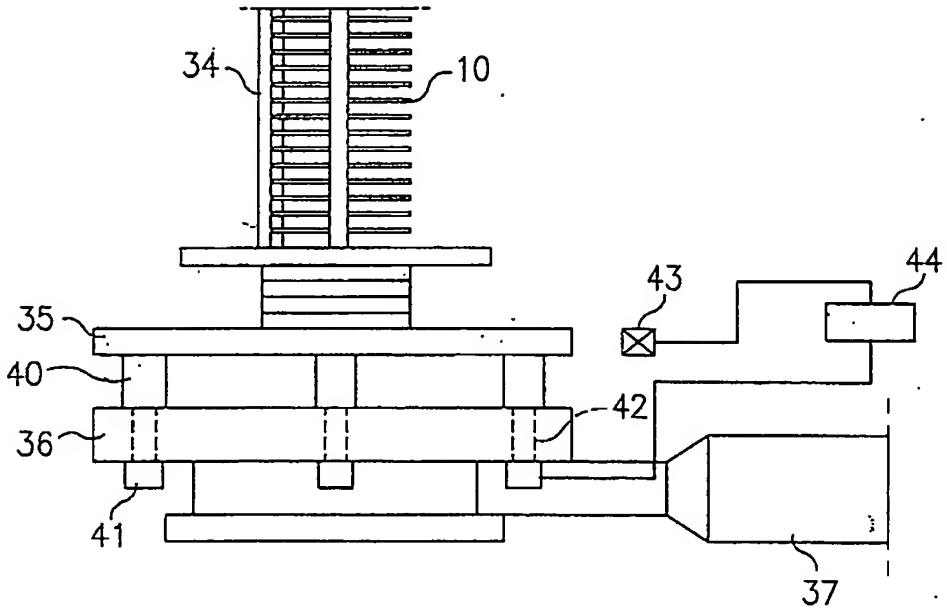


FIG. 5